

**PLANAR LIGHTWAVE CIRCUIT FOR
CONDITIONING TUNABLE LASER OUTPUT**

CLAIMS

5 What is claimed is:

1. A planar lightwave circuit (PLC) module for conditioning light output from a tunable laser designed to generate light at a target wavelength, the PLC module comprising:

a substrate;

10 a primary waveguide embedded in said substrate, said primary waveguide having an input end for receiving light from the tunable laser and an output end for outputting said light;

at least a first secondary waveguide embedded in said substrate, said first secondary waveguide receiving a first portion of said light from the tunable laser; and

15 a filter having a passband centered on the target wavelength and coupled to an output of the first secondary waveguide to receive said first portion of light, wherein said filter is adapted to generate a signal related to the intensity of said first portion of light in the passband centered on the target wavelength.

20 2. The PLC module of claim 1, further comprising a second secondary waveguide that receives a second portion of said light from the tunable laser and a power monitoring photosensor coupled to an output of the second secondary waveguide to receive said second portion of light, wherein said photosensor is adapted to generate a signal related to the intensity of said second portion of light.

25 3. The PLC module of claim 2, wherein the power monitoring photosensor comprises a photodiode.

4. The PLC module of claim 2, wherein said secondary waveguides each receive a

respective portion of said light from the tunable laser by direct or indirect evanescent coupling from said primary waveguide.

5 5. The PLC module of claim 1, wherein said substrate is a silica or silicon substrate and the waveguides are patterned silicon oxide waveguides embedded in said substrate.

6. The PLC module of claim 1, wherein the target wavelength is one of a plurality of different target wavelengths.

10 7. The PLC module of claim 6, wherein the filter is a tunable filter the passband of which can be selectively centered on any of the plurality of target wavelengths.

15 8. The PLC module of claim 6, wherein the filter is a multiple-output filter having a plurality of filters, one for each of the plurality of target wavelengths, each of said filters having a passband centered on a respective one of the plurality of target wavelengths and adapted to generate a signal related to the intensity of said first portion of light in the respective passband of said each filter, whereby said multiple-output filter provides a plurality of output signals related, respectively, to the intensity of said first portion of light in passbands centered on each of the plurality of target wavelengths, respectively.

20 9. The PLC module of claim 8, wherein said multiple-output filter comprises a reflectively coupled zigzag waveguide.

25 10. The PLC module of claim 8, wherein said multiple-output filter comprises:
a plurality of substantially identical distributed dielectric multilayer stack filters mounted in the substrate, each multilayer stack filter having a passband determined in part by the angle at which filtered light impinges on said filter;
a plurality of secondary filter waveguides, one for each of the multilayer stack filters, each of the plurality of secondary filter waveguides receiving light from said first secondary waveguide and patterned in the substrate so as to terminate at a unique
30 angle with respect to its corresponding multilayer stack filter so that each multilayer

stack filter has a passband centered on a respective one of the plurality of target wavelengths.

11. The PLC module of claim 1, wherein said primary waveguide comprises a conditioning
5 device between its input and output ends for conditioning said light so that the primary waveguide provides, at its output end, light from the tunable laser conditioned by the conditioning device.

12. The PLC module of claim 11, said conditioning device is one of a semiconductor optical
amplifier and a modulator.

13. The PLC module of claim 1, wherein said first secondary waveguide receives said first
portion of light by direct or indirect evanescent coupling from said primary waveguide.

14. A system for conditioning light output from a tunable laser designed to generate light at a
15 target wavelength, the system comprising:

a planar lightwave circuit (PLC) module comprising:

a substrate;

a primary waveguide embedded in said substrate, said primary waveguide having an
input end for receiving light from the tunable laser and an output end for
20 outputting said light;

at least a first secondary waveguide embedded in said substrate, said first secondary
waveguide receiving a first portion of said light from the tunable laser; and

a filter having a passband centered on the target wavelength and coupled to an output
of the first secondary waveguide to receive said first portion of light, wherein
25 said filter is adapted to generate a filter output signal related to the intensity of
said first portion of light in the passband centered on the target wavelength; and
a processor for generating, based on said filter output signal, a control signal, to adjust
the lasing wavelength of the tunable laser to achieve or maintain the target
wavelength.

15. The system of claim 14, further comprising the tunable laser.

16. The system of claim 14, further comprising driver circuitry for receiving said control signal and for generating, in response to said control signal, analog signals to control the lasing wavelength of the tunable laser.